

**Before the
Federal Communications Commission
Washington, D.C. 20554**

In the Matter of

Spectrum Horizons

James Edwin Whedbee Petition for
Rulemaking to Allow Unlicensed Operation
in the 95-1,000 GHz Band

ET Docket No. 18-21

RM-11795

COMMENTS OF FACEBOOK, INC.

Facebook, Inc. (“Facebook”) is pleased to submit these comments in response to the Commission’s *Notice of Proposed Rulemaking* in the above-captioned proceeding.¹ Facebook’s mission is to give people the power to build community and bring the world closer together. And connecting people is a critical first step in executing this mission. Today, nearly four billion people are still not connected to broadband Internet.² Connecting these people—most of whom live in the developing world—is a complicated effort that requires not just bringing network infrastructure to more people, but involves addressing the regulatory environment. To do its part, Facebook, working with a range of partners, has launched several initiatives focused on connecting the unconnected and under-connected.

Spectrum policy and regulations affect both the affordability and availability of the Internet. Improving connectivity in the United States and around the world means pursuing

¹ In the Matter of Spectrum Horizons, ET Docket No. 18-21 (rel. Feb. 28, 2018) (“Spectrum Horizons NPRM”).

² The Inclusive Internet Index: Bridging digital divides at 8 (citing ITU, Key ICT indicators for developed and developing countries and the world, 2005-2016) *available at* <https://theinclusiveinternet.eiu.com/assets/external/downloads/3i-bridging-digital-divides.pdf>.

spectrum policy that maximizes the utilization of this limited resource and promotes the expansion of both the capacity and coverage of wireless networks. As an innovator in spectrum management and policy, the Commission is in a unique position to adopt spectrum policies that achieve these objectives, while also setting an example for the rest of the world. To this end, Facebook has long supported opening today’s “spectrum horizons” to “make the spectrum above 95 GHz more readily accessible for new innovative services and technologies.”³ As Facebook has noted in the past, making commercial spectrum authorizations available above 95 GHz will help “move technology from academic ideas to real-world solutions.”⁴

As the Commission decides on the details of making spectrum above 95 GHz more accessible, it should consider the following general principles:

- *Promote flexible use.* Spectrum policy should promote flexible use of spectrum and sharing across users and platforms, such as mobile, satellite, and new technologies like high-altitude solar aircraft. It will take a mix of technical solutions to bring connectivity to all. Spectrum use above 95 GHz will be highly directed (not isotropically distributed) making these bands well-suited for sharing.
- *Balance unlicensed, lightly licensed, and licensed spectrum.* Unlicensed, lightly licensed, and licensed spectrum allocations are critical to the expansion of wireless infrastructure. Ensuring sufficient unlicensed spectrum is available drives innovation and investment in a range of technologies that can complement and support networks and expand broadband access at low cost.
- *Ensure an abundant supply of spectrum is available.* Making available as much of this high band spectrum as possible will help to reduce service provider barriers to entry and increase competition and innovation across a wide range of broadband use cases. Fair and efficient spectrum management mechanisms are critical to making spectrum available for a variety of use cases.

³ Spectrum Horizons NPRM ¶ 1.

⁴ Comments of Facebook, Inc., Use of Spectrum Bands above 24 GHz, et al., Report and Order and Further Notice of Proposed Rulemaking, GN Docket 14-177 at 6 (filed Sep. 30, 2016) (supporting the Commission’s efforts to identify and allocate spectrum above 95 GHz for commercial use).

- *Enhance both the capacity and coverage of networks.* Promote policies that not only enhance network capacity but also expand their coverage to underserved areas and populations. Policies based on the above principles could help to make this spectrum a bedrock for a range of new technologies that will expand and enhance connectivity around the world.

These principles can be applied to the allocation of spectrum above 95 GHz.

1. Promote flexible use:

In the abundant spectrum available above 95 GHz, the Commission should promote flexible use and coexistence among a variety of use cases that are currently being contemplated, as well as new technologies not yet foreseen. Potential use cases for these high spectrum bands include high-capacity short-range indoor connectivity at tens of gigabits per second between machines, high-capacity long-range wireless backhaul links, as well as long distance high-altitude platform (HAP) to HAP links and satellite to satellite links that would minimize the number of required ground stations. These use cases in spectrum above 95 GHz are currently being researched internationally. Connecting the unconnected and enhancing user interfaces and device automation in the future will require a mix of technical solutions. This mix of technical solutions will require access to spectrum, including spectrum above 95 GHz. Therefore, as the Commission allocates this spectrum it should consider a framework that allows for the coexistence of multiple platforms and users. And the Commission should ensure that its decisions do not preclude any of these potential use cases or other future innovations.

2. Balance unlicensed, lightly licensed, and licensed spectrum allocations:

The Commission should ensure that a variety of use cases, including access use cases, such as high-capacity short-range indoor connectivity, and backhaul use cases, like high-capacity links, are supported by the proper balance of unlicensed, lightly licensed, and licensed spectrum within these spectrum bands. Sufficient unlicensed spectrum will be needed to meet the

spectrum needs for access technologies, machine-to-machine communications and other use cases in the future. And lightly licensed spectrum under a link registration system should also be available to support high powered wireless backhaul use cases. Additionally, exclusively licensed spectrum blocks could support new use cases, such as a neutral host network that would encourage shared infrastructure. However, the Commission's proposal makes just 15.2 gigahertz of (noncontiguous) spectrum available for unlicensed use and 102.2 gigahertz of spectrum available under a lightly licensed framework.⁵ Instead, the Commission should reconsider its proposed balance between unlicensed and lightly licensed spectrum and shift the balance towards equal allocations among unlicensed, lightly licensed, and exclusively licensed frameworks within this spectrum to better support both access and backhaul use of this spectrum. The Commission should also make the available spectrum blocks larger and less fragmented.

Alternatively, rather than dividing this spectrum into separate unlicensed and licensed bands, the Commission should consider licensing rules tailored to use cases that allow for coexistence across bands. Spectrum rules could be based on factors such as: indoor/outdoor use; terrestrial/space use; or power level based distinctions. For example, spectrum could be allocated for unlicensed use indoors and lightly licensed use outdoors within the same band.

3. Use effective spectrum management to allow new technologies to flourish in the abundant spectrum available above 95 GHz:

The Commission should craft fair and efficient spectrum management mechanisms that will allow new and innovative technologies to flourish. Specifically, the Commission should consider how its lightly licensed, link registration framework would be administered on a point-

⁵ Spectrum Horizons NPRM ¶ 1.

to-multipoint, mesh network.⁶ Such networks, like Facebook’s project Terragraph, a low-cost high-throughput (multi-Gigabit) multi-node mesh wireless network for dense urban topologies could provide fiber-like capability for access and backhaul at a lower upfront cost.⁷ Although Terragraph is designed to be deployed in the 60 GHz band, the Commission should keep open the possibility of similar networks in the frequencies raised in this NPRM. The Commission should consider ways to simplify as well as drive down the cost of link registration in mesh networks. License fees for link registration should cover the costs of administration only and should not make point-to-multipoint technologies cost-prohibitive or infeasible to deploy.

4. Additionally, Facebook Supports the Commission’s Proposal to Amend Its Experimental Radio Service Rules for Spectrum Between 95 GHz and 3 THz.

Facebook supports the Commission’s proposal to amend its experimental radio service rules “to better encourage experiments in the spectrum range between 95 GHz and 3 THz.”⁸ The Commission’s experimental licensing framework is a critical means to innovation in the band. Broadening the eligibility requirements and allowing experimental access to the full range of spectrum bands between 95 GHz and 3 THz will help encourage further innovation.

5. Conclusion

In conclusion, Facebook fully supports the Commission’s efforts to make available more spectrum above 95 GHz for commercial use. With policies in place that promote flexible use, balance unlicensed, lightly licensed, and licensed spectrum, and manage spectrum fairly and

⁶ See *id.* ¶ (proposing to apply link registration rules similar to those under Part 101).

⁷ Introducing Facebook’s new terrestrial connectivity systems—Terragraph and Project Aries, <https://code.facebook.com/posts/1072680049445290/introducing-facebook-s-new-terrestrial-connectivity-systems-terragraph-and-project-aries/>.

⁸ Spectrum Horizons NPRM ¶¶ 70-81.

efficiently, this spectrum could become the bedrock for a range of new technologies that will expand and enhance connectivity around the world.

Respectfully submitted by:

/s/ Alan Norman
Christopher Weasler
Alan Norman
Facebook, Inc.
1 Hacker Way
Menlo Park, CA 94025